Visit to BNL 17-19 Nov 2008

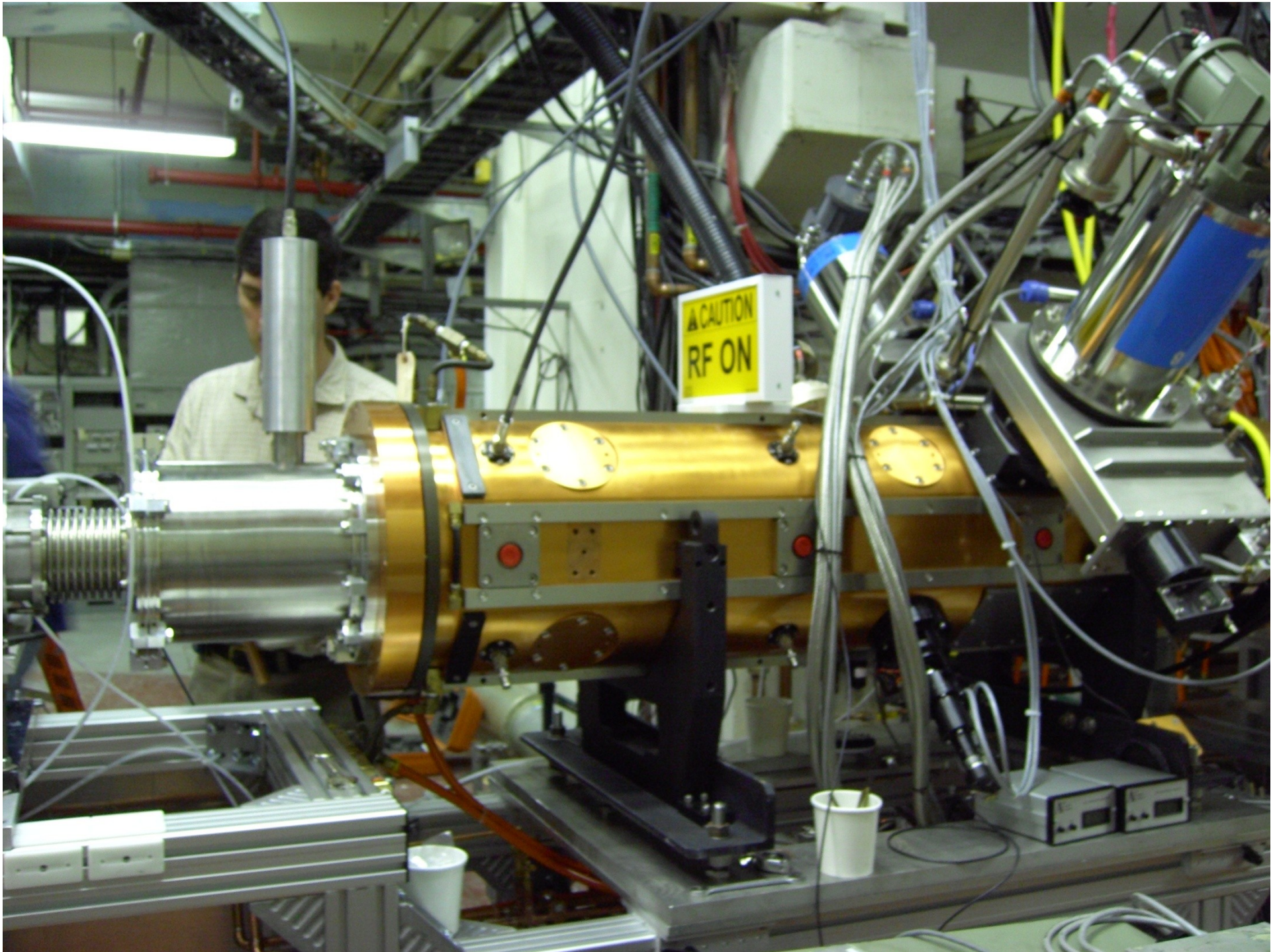
C. Schmidt, D. Bollinger, C.Y. Tan

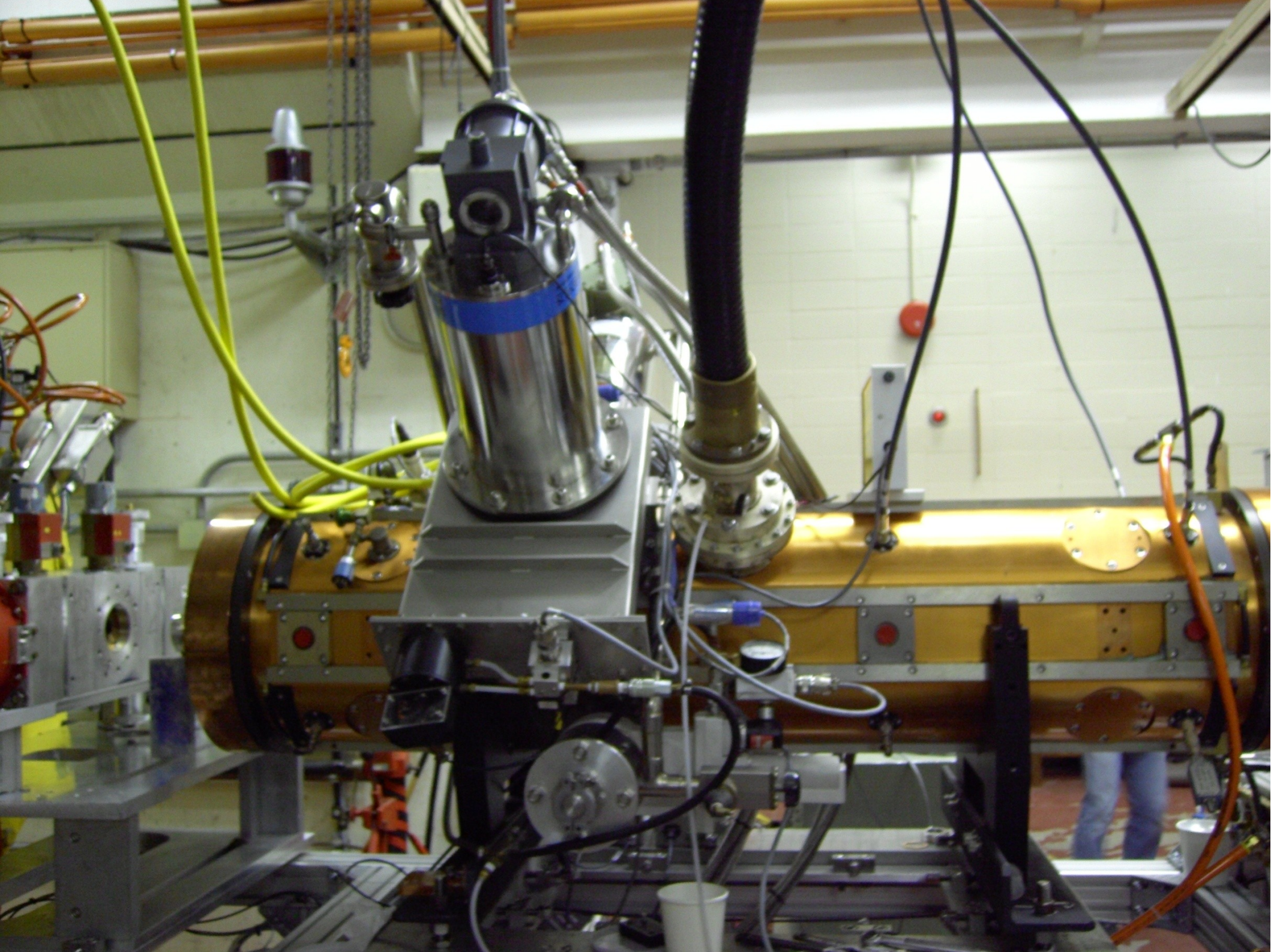
BNL People

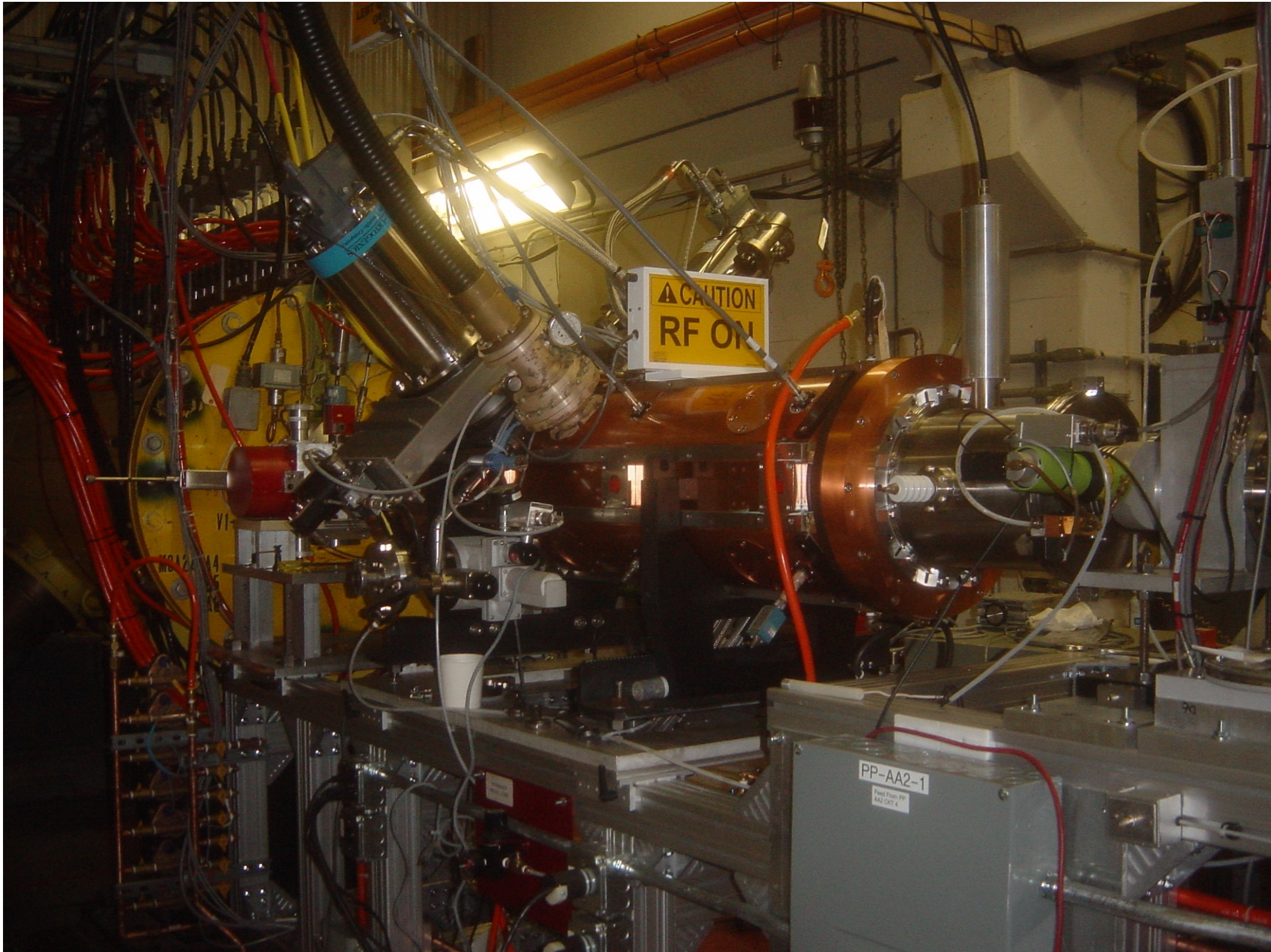
- James Alessi
- Vinnie Lodestro
- Deepak Raparia (Linac group leader)

RFQ

- 200MHz structure
- About 1 m long.
- Input energy is 35KeV
- Output energy is 750KeV
- Designed/built about 20 years ago by John Staples.
- Interesting note: There are parts of the BNL RFQ which FNAL cancelled.


CAUTION
RF ON




CAUTION
RF ON
PP-AA2-1

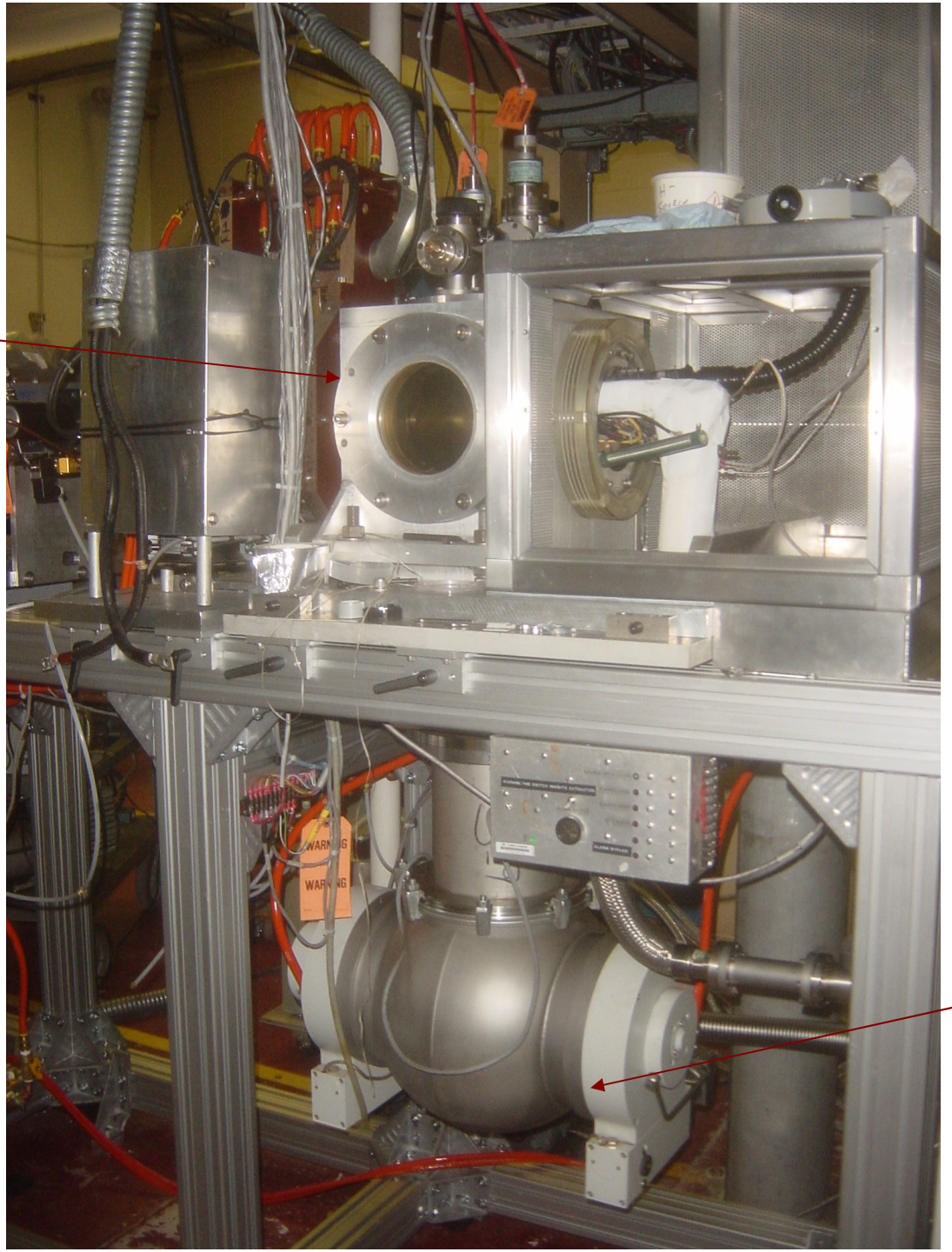
The Source

- Takes about 1 shift (8 hrs) to start up a new H- source. (c.f. FNAL which takes about 2-3 days).
- The source lasts for at least 9 months.
- From empirical experiment, the output of the H- source is a combination of gas flow, cesium and magnetic field.

The source con't

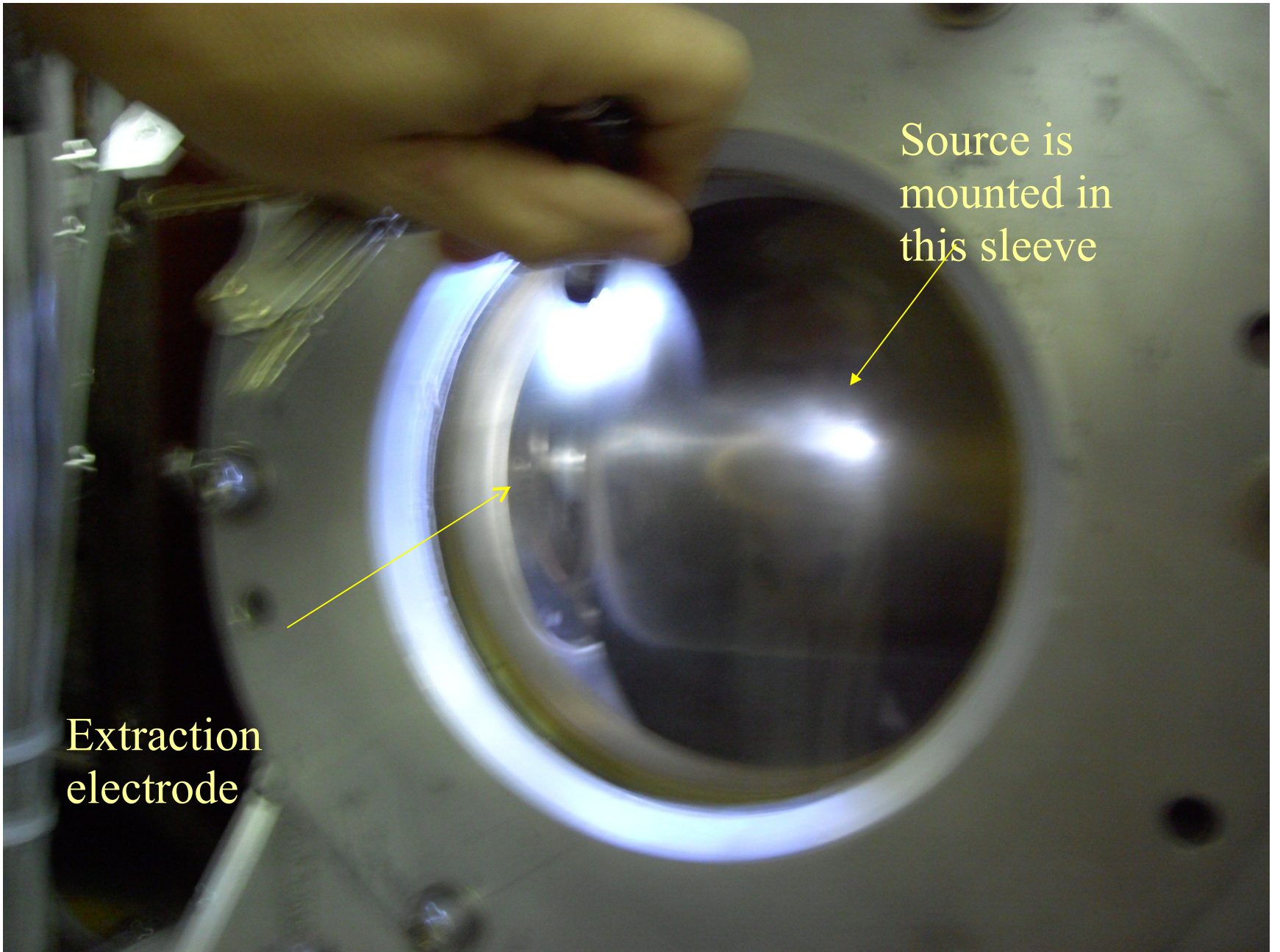
- Source has no heater, bnl experience shows that it made little difference
- Output of source could vary by a few milliamps, the RFQ acts like a beam current "filter" (what gets captured in the RF bucket), so the source has a lot of headroom. This means that even if the source starts to trail off, the output of the RFQ remains constant.
- BNL source uses a hand made H2 valve that uses a cap discharge to open. The valve is very fast (rise and fall times) and is not subjected to the full heat of the source.
- Like FNAL, BNL tried several variations of asymmetric cathodes and found little or no improvement on source operation.
- BNL operates their cesium boiler at $\leq$100C whereas FNAL H- & I- operate at ~140C. The HINS source has been operated to $\leq$100C.
- BNL uses a permanent magnet for their source. The H- and I- sources use an electromagnet. The HINS source will use a permanent magnet with a small trim electromagnet (~20 Gauss).
- BNL experience is that a lower arc current $\Rightarrow$ cleaner source. The H- and I- sources run at ~50A. The HINS source has ran at ~10A.

The source in the cube

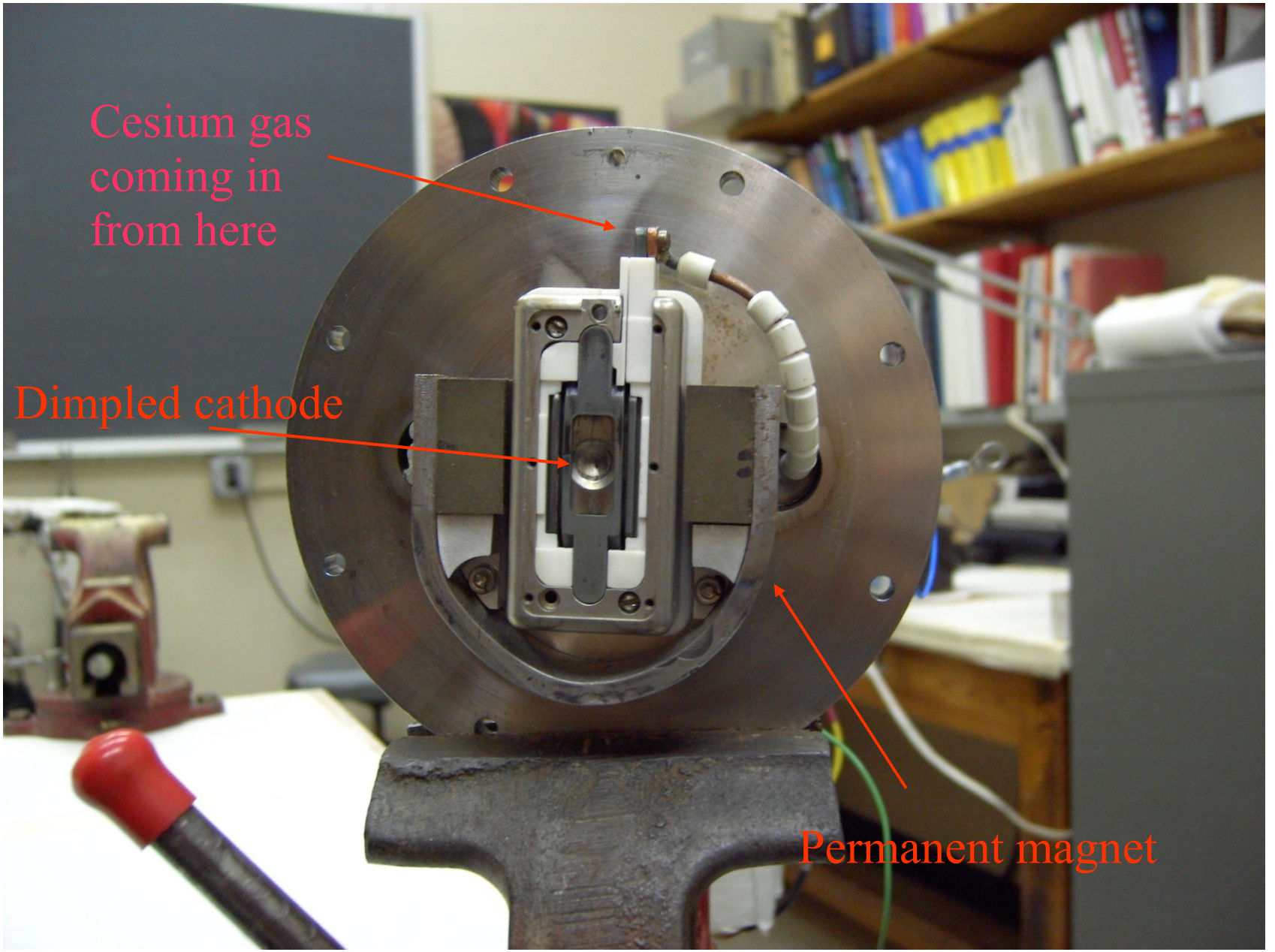


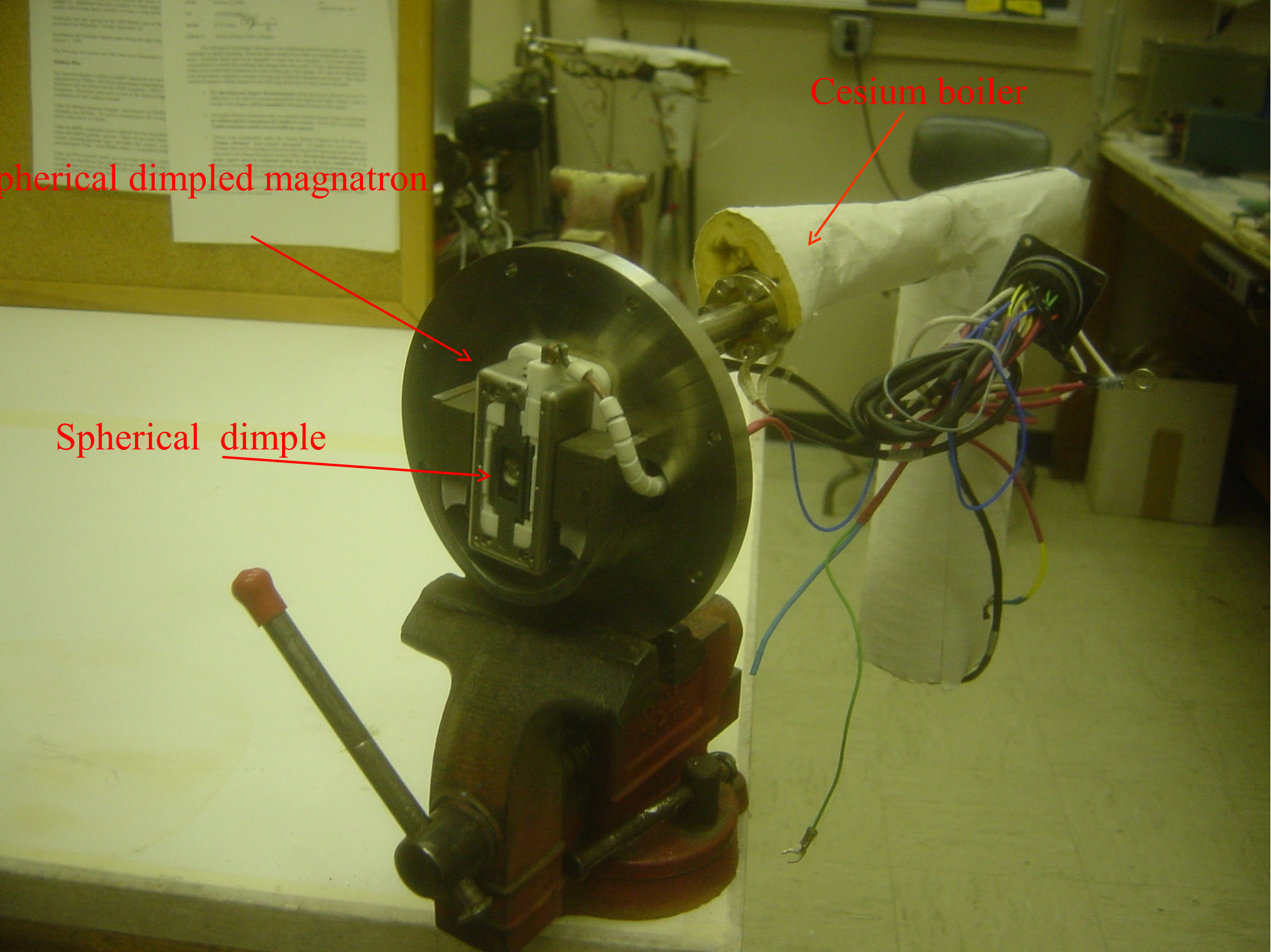
3000 l/s pump

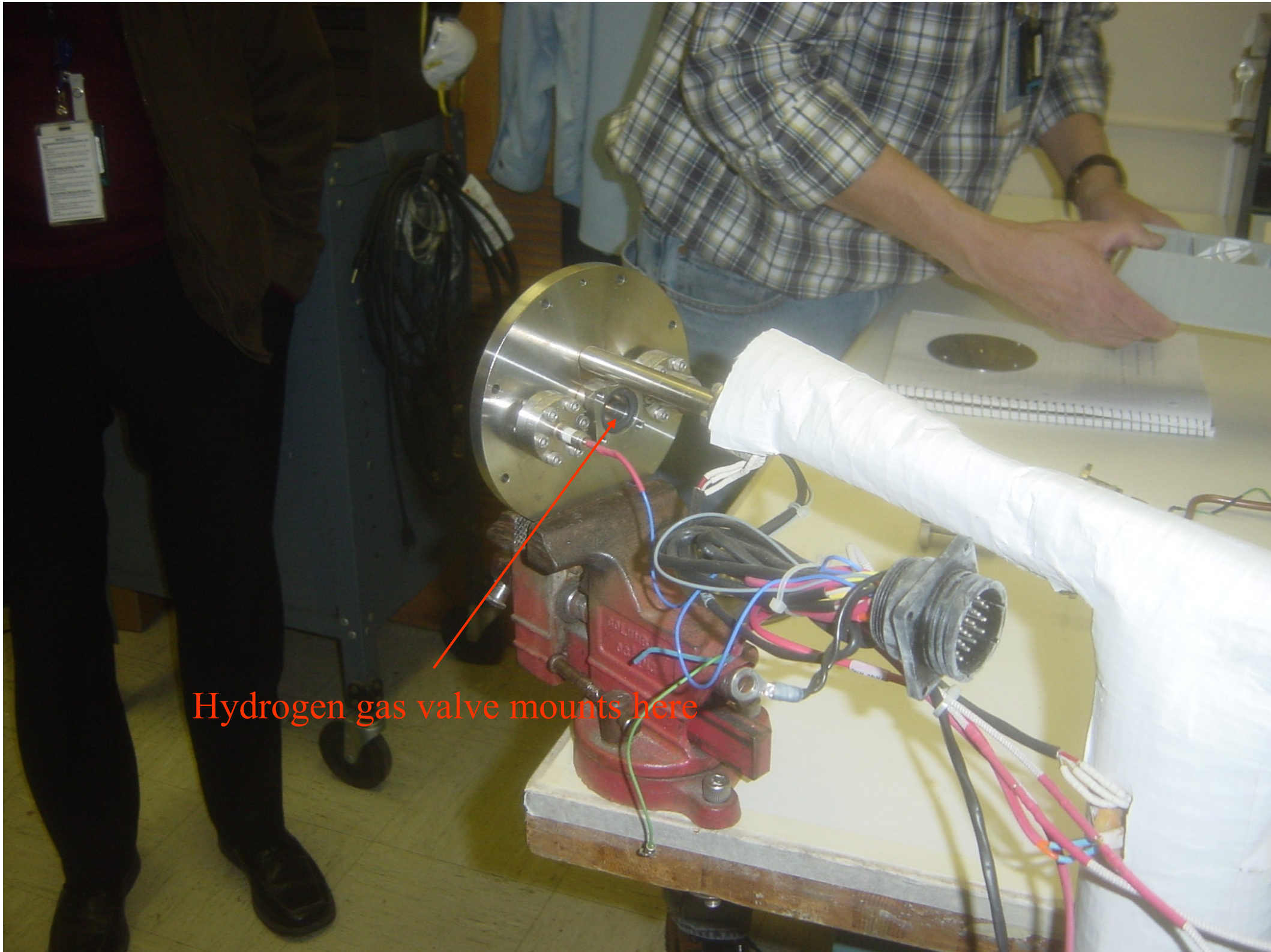
Source in the Cube



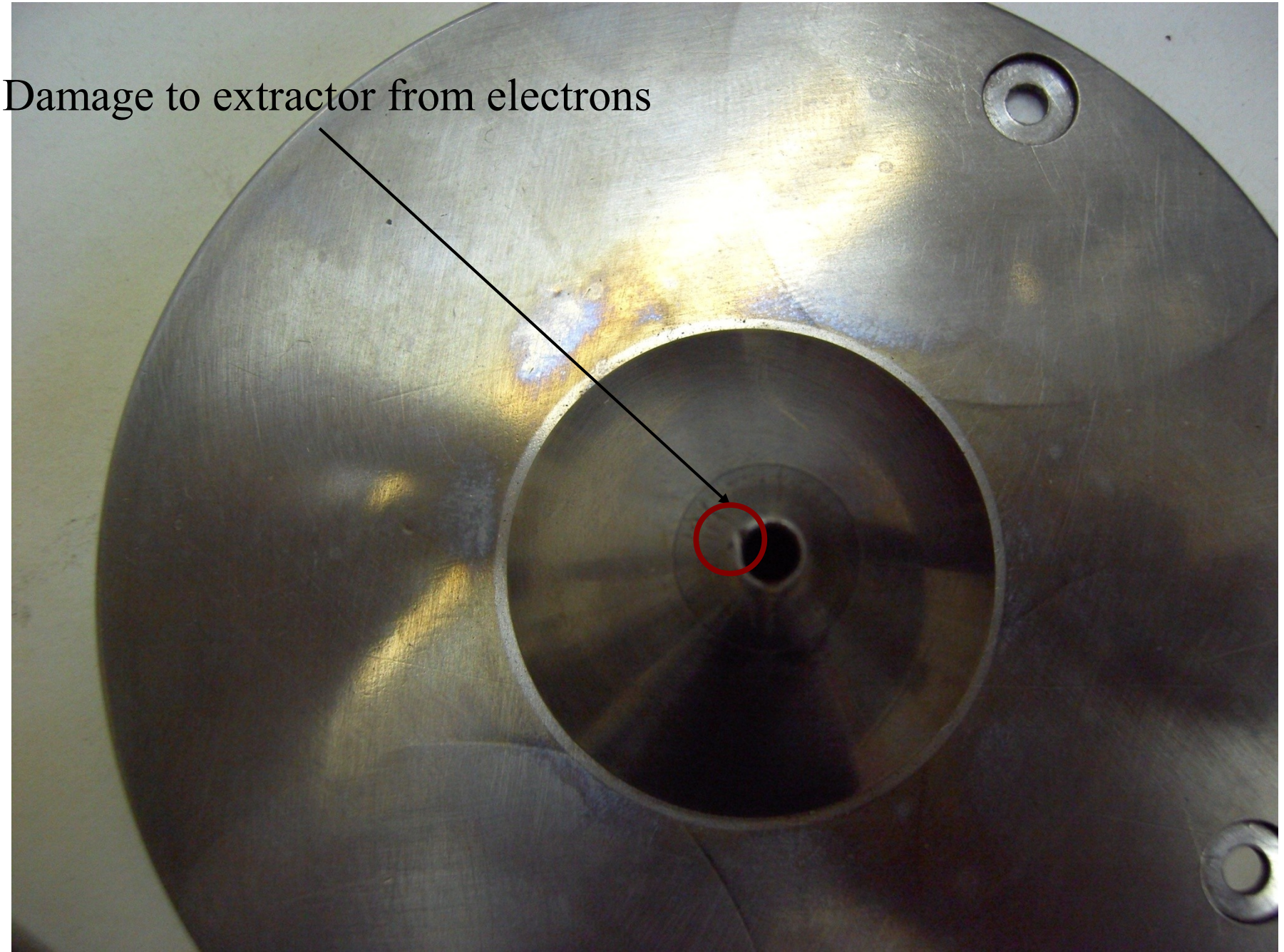
Source disassembled



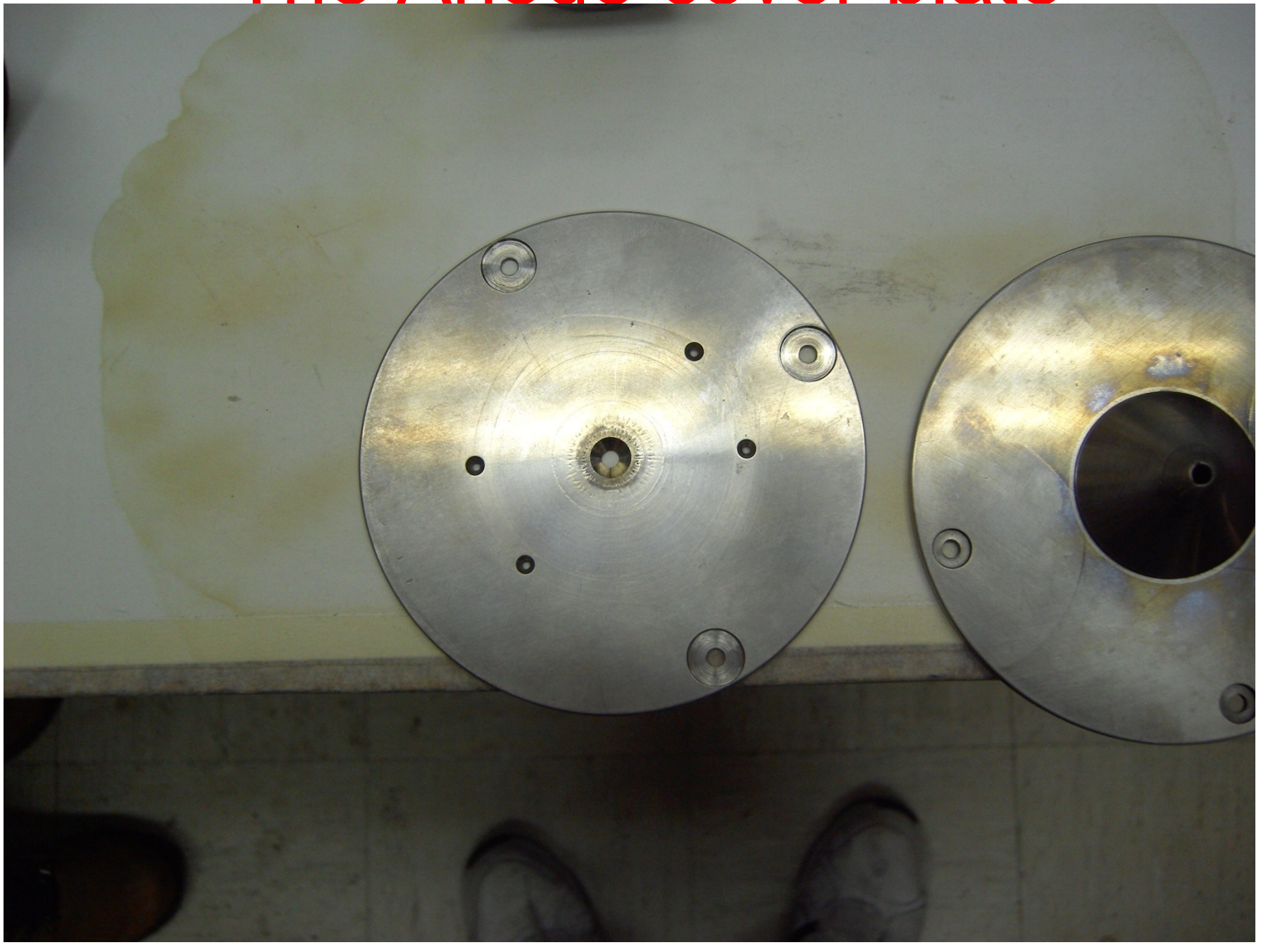

pherical dimpled magnatron
Cesium boiler
Spherical dimple


Hydrogen gas valve mounts here

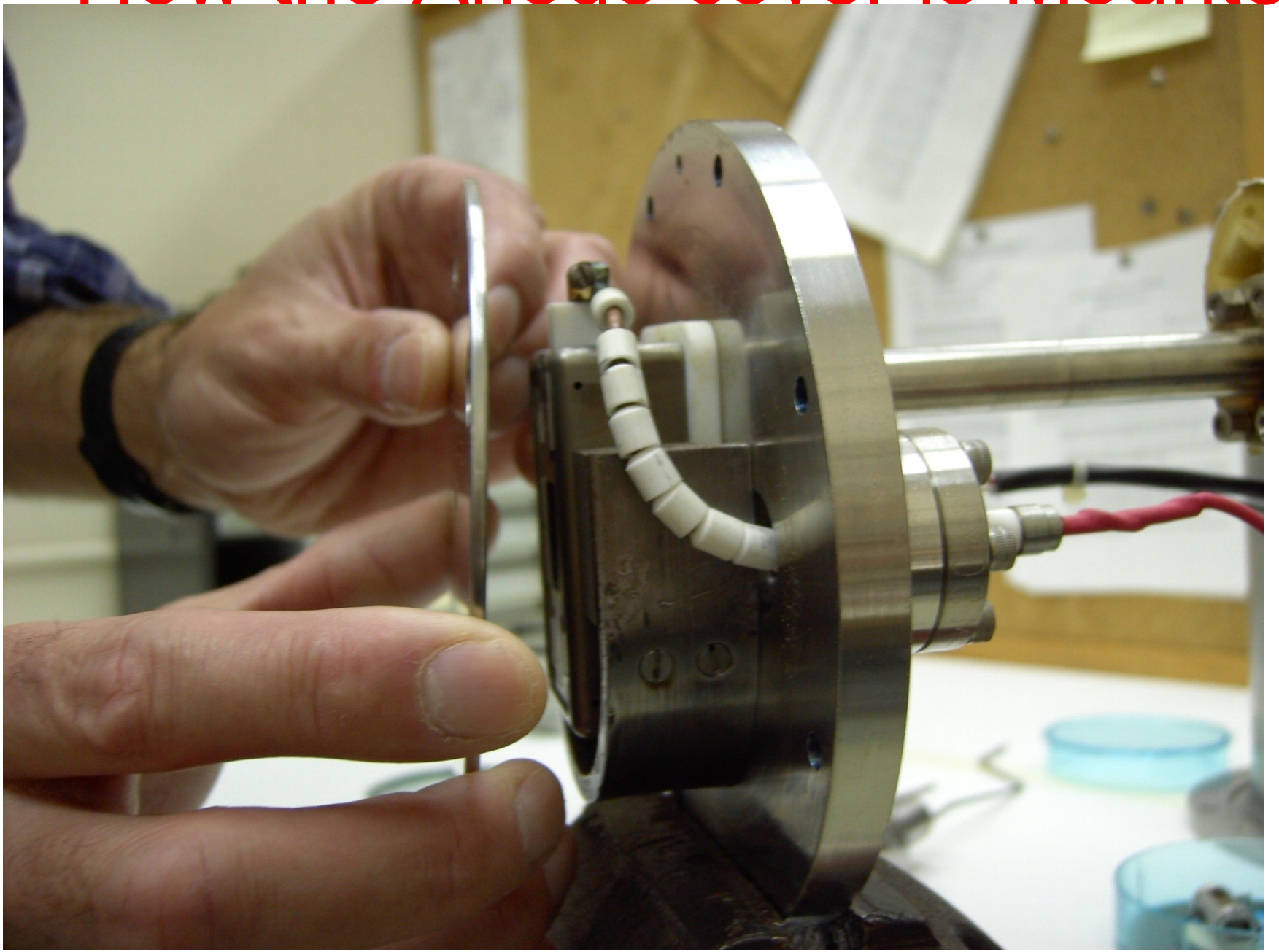
Extractor



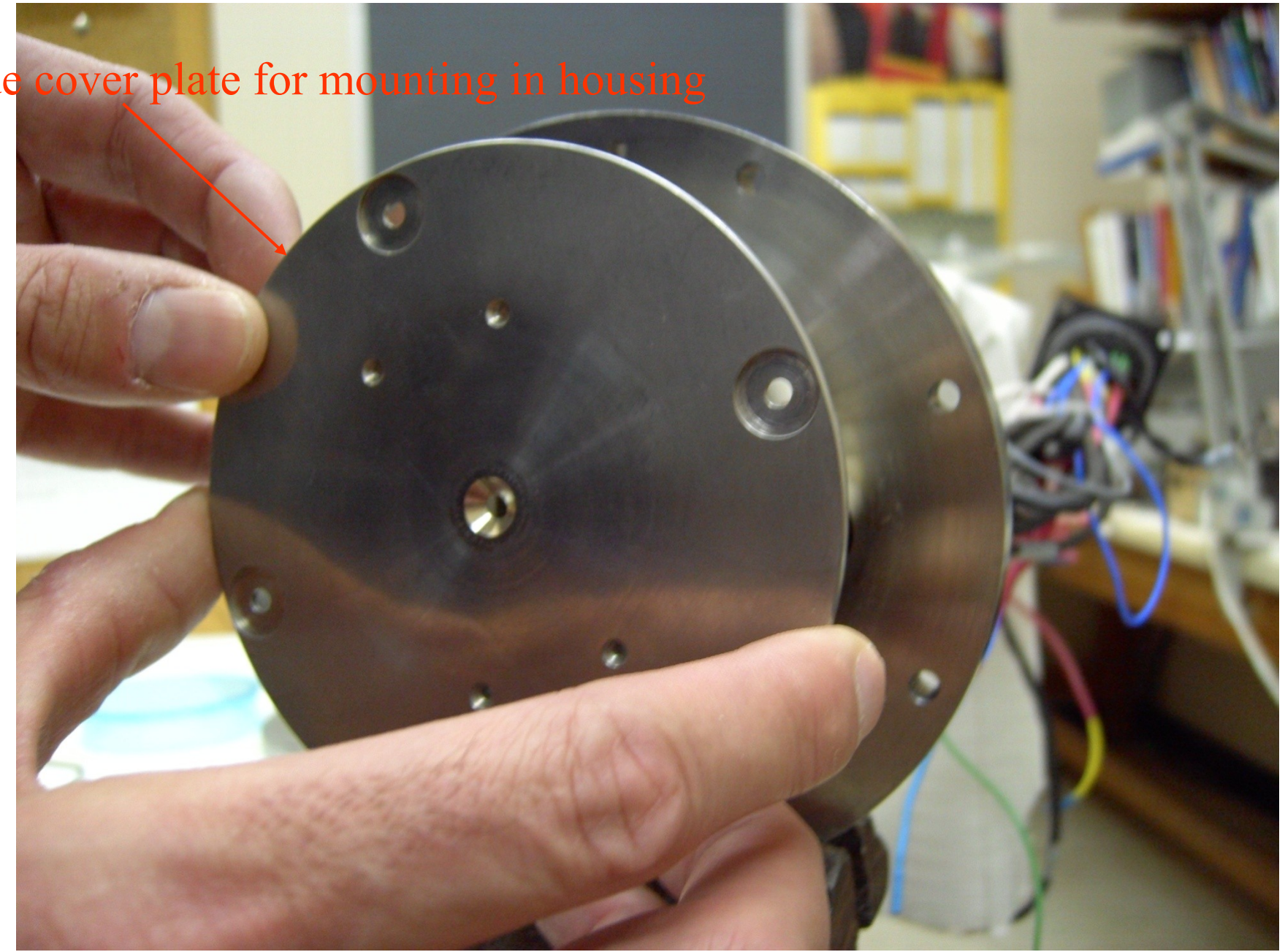
The Anode cover plate



How the Anode cover is Mounted



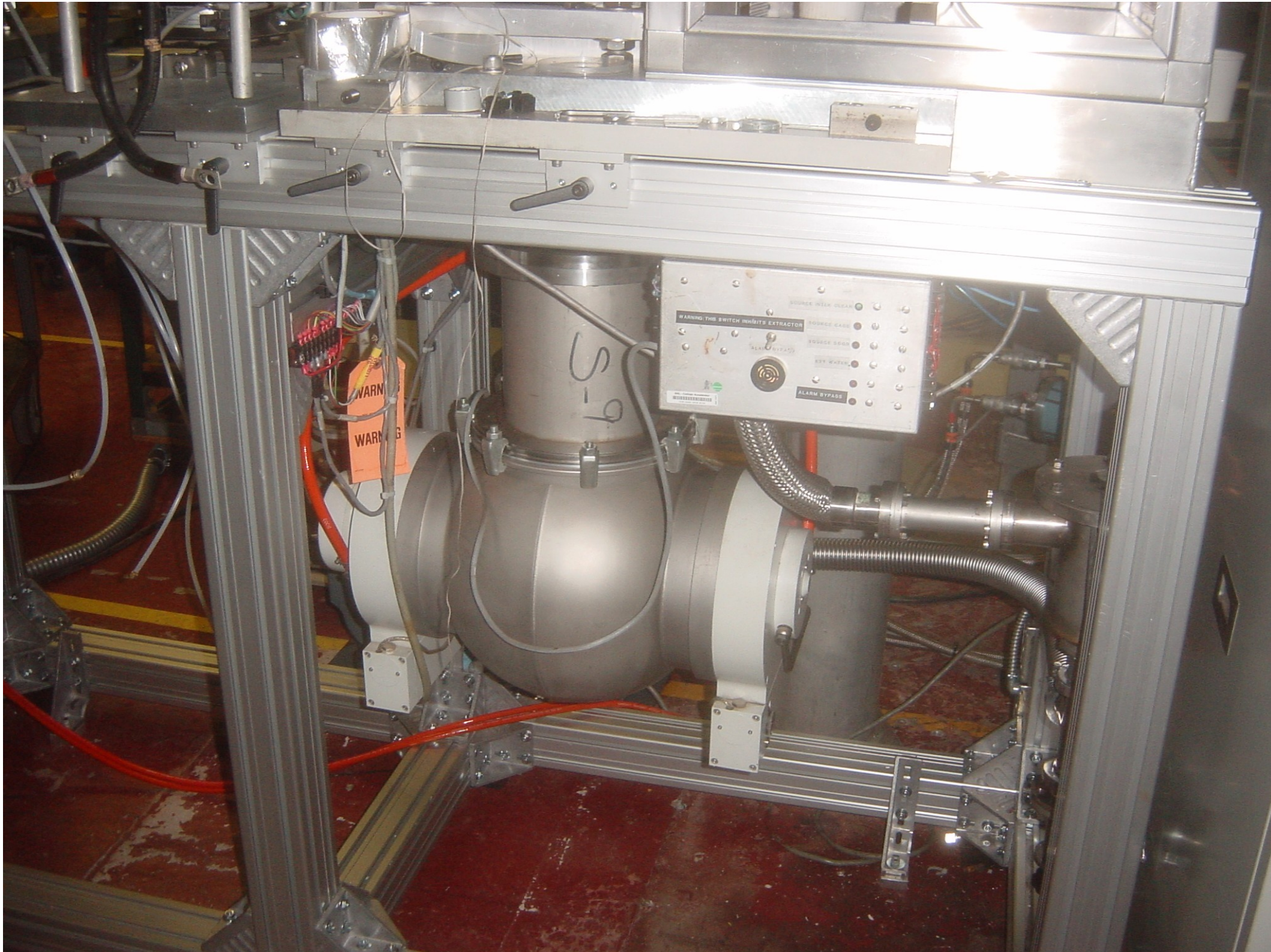
Another View

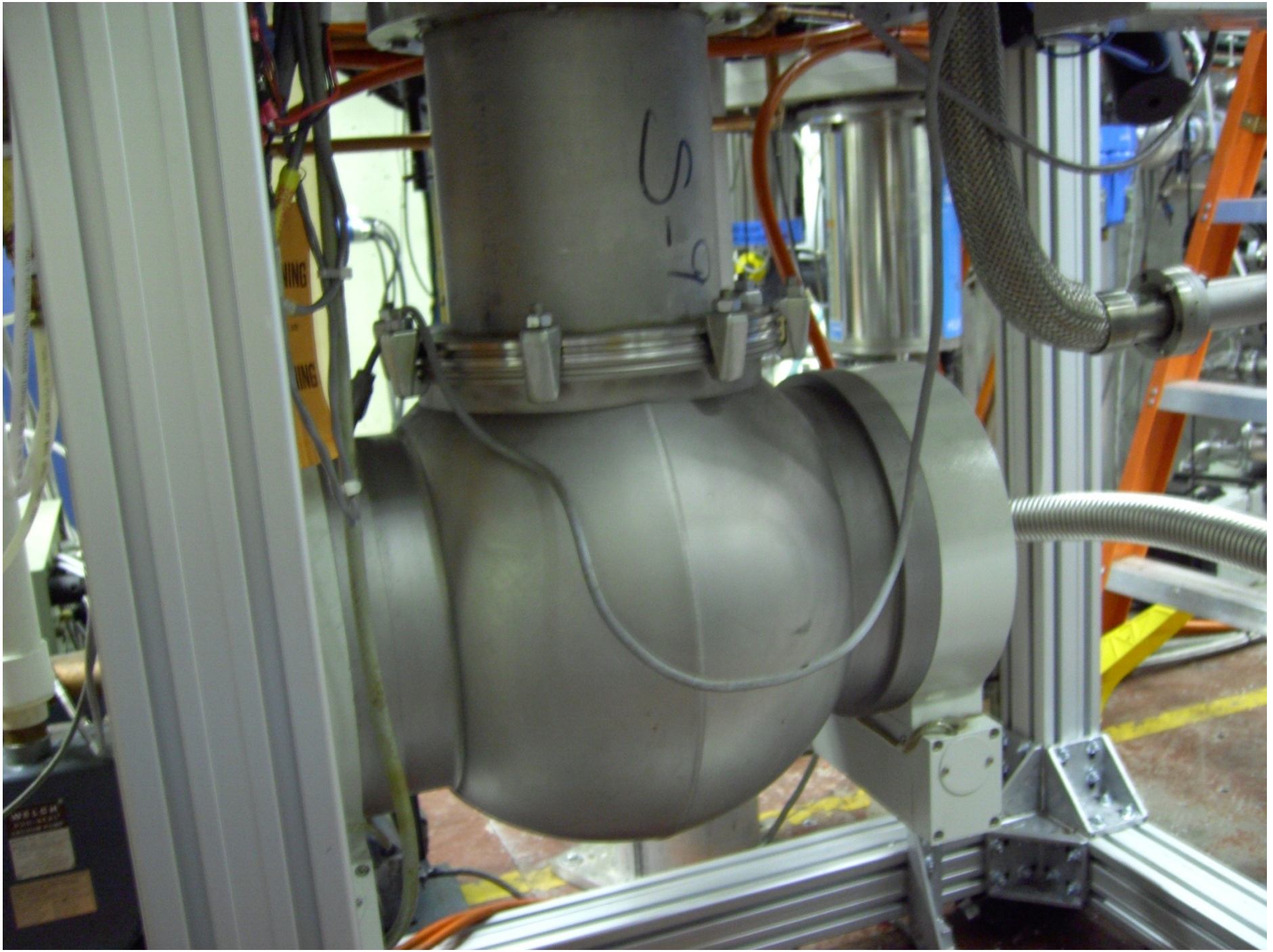


Extractor is connected to the Anode via ceramic standoffs

Pump at Source

- 3000 Litre/second pump.
- ~10 in pipe.
- Vacuum in the low 1e-6 torr.


WARNING THIS SWITCH INHIBITS EXTRACTOR
ALARM BYPASS



Conclusion

- To test the hypothesis that the reason why our source performs differently from the BNL ones, we think that the new HINS source might give us the answer because
  - The new source for HINS will have much better vacuum than the operational source.
  - HINS source will also have a lower arc current (~ 10A) compared to ~50A.
- We want to see if the HINS source can output 80mA continuously for 6 to 9 months.